CLAIMS

What is claimed is:

1. A method for monitoring condition of a material, said method comprising:
representing the condition of the material with multiple states, at least one of the states observable with an inspection;
using the multiple states with a model to estimate state progression; and
scheduling an inspection based on the progression of the multiple states.

2. A method as claimed in Claim 1 wherein the states comprise a damage state.

3. A method as claimed in Claim 1 wherein the states comprise a precursor state.

4. A method as claimed in Claim 1 wherein the model is used to pre-compute a database of damage progression conditions as a function of the states for rapid assessment of damage condition for decision support.

5. A method as claimed in Claim 1 wherein the states are selected to ensure observability of a particular damage progression behavior mode.

6. A method as claimed in Claim 1 wherein at least one of the multiple states is an initially preassumed crack size.

7. A method as claimed in Claim 1 wherein the inspection is performed by a nondestructive evaluation method.

8. A method as claimed in Claim 1 wherein the inspection comprises onboard diagnostics.

9. A method as claimed in Claim 1 wherein the inspection comprises eddy current sensors mounted on a surface of the material.

10. A method as claimed in Claim 1 wherein at least one of the states is fatigue.

11. A method as claimed in Claim 10 wherein fatigue damage progression is monitored continuously.

12. A method as claimed in Claim 10 wherein fatigue damage progression is monitored occasionally.

13. A method as claimed in Claim 12 further comprising:

increasing frequency of inspection for fatigue damage progression monitoring as the damage progresses.

14. A method as claimed in Claim 1 wherein the model is adapted as the states progress.

15. A method as claimed in Claim 1 wherein the material is part of an aircraft component.

16. A method as claimed in Claim 15 further comprising:

deciding disposition of a component based on the material condition states.

17. A method as claimed in Claim 16 wherein the disposition comprises aircraft maintenance.

18. A method as claimed in Claim 16 wherein the disposition comprises repair or rework.

19. A method as claimed in Claim 16 wherein the disposition comprises airworthiness.

20. A method as claimed in Claim 1 further comprising:
monitoring rates of change of states.

21. A method as claimed in Claim 21 wherein the rates of change of selected states are determined from inspections at at least two different times.

22. A method as claimed in Claim 1 further comprising:
selecting a health control action designed to achieve a quantitative goal according to a control algorithm.

23. A method as claimed in Claim 22 wherein the control action is rework.

24. A method as claimed in Claim 23 wherein the rework is shot peening.

25. A method as claimed in Claim 22 wherein the quantitative goal is a reduction of total ownership cost without reducing readiness.

26. A method as claimed in Claim 25 wherein the quantitative goal is constructed from an assessment of available quantitative current and historical information combined with expert qualitative information.

27. A method for health control of an article comprising:
examining material condition of an article with an eddy current sensor;
determining presence of an early stage damage;
performing a health control action on the article; and
establishing a baseline condition for future inspections with another examination of the article with the eddy current sensor.

28. A method as claimed in Claim 27 wherein the eddy current sensor is a sensor array.

29. A method as claimed in Claim 27 wherein the sensor is mounted to a surface of the article.

30. A method as claimed in Claim 27 wherein the sensor is scanned over a surface of the article.

31. A method as claimed in Claim 27 further comprising:

integrating the health control action with scheduling of inspections.

32. A method as claimed in Claim 27 wherein the control action is rework.

33. A method as claimed in Claim 32 wherein the rework is shot peening.